

Name: _____

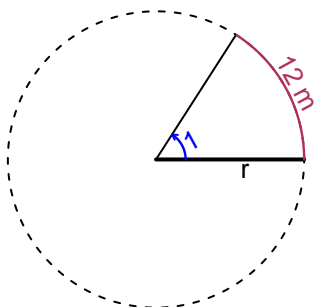
Date: _____

Trig Final (SLTN v626)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 12 meters. The angle measure is 1 radians. How long is the radius in meters?

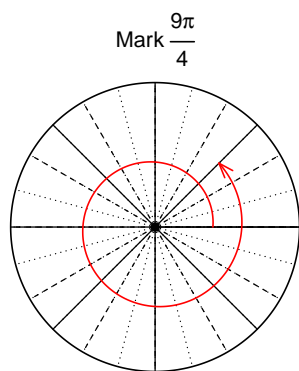


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$r = 12$ meters.

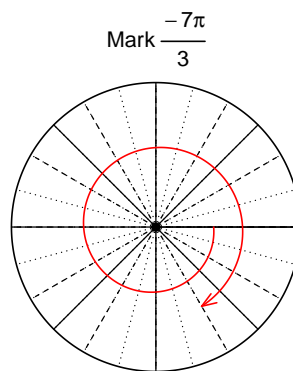
Question 2

Consider angles $\frac{9\pi}{4}$ and $-\frac{7\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{9\pi}{4}\right)$ and $\sin\left(-\frac{7\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\cos(9\pi/4)$

$$\cos(9\pi/4) = \frac{\sqrt{2}}{2}$$



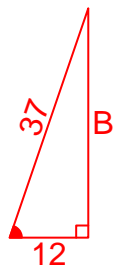
Find $\sin(-7\pi/3)$

$$\sin(-7\pi/3) = -\frac{\sqrt{3}}{2}$$

Question 3

If $\cos(\theta) = \frac{-12}{37}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

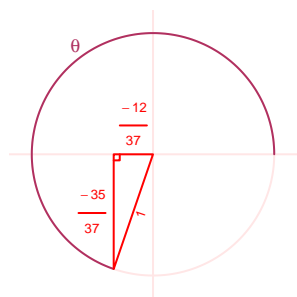
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}12^2 + B^2 &= 37^2 \\ B &= \sqrt{37^2 - 12^2} \\ B &= 35\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-35}{37}}{\frac{-12}{37}} = \frac{35}{12}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 2.68$ meters, a frequency of 6.85 Hz, and an amplitude of 5.05 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.05 \cos(2\pi 6.85t) + 2.68$$

or

$$y = 5.05 \cos(13.7\pi t) + 2.68$$

or

$$y = 5.05 \cos(43.04t) + 2.68$$